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ABSTRACT

The comprehending score is a theoretically derived measure of language processing that identifies those miscues that indicate that the reader is making sense of the printed language he or she is attempting to read. A study was undertaken to explore the relationships between post oral reading cloze test scores and seven theoretically constructed variants of the comprehending score. The study probed the variants from two different vantage points: performance on post oral reading cloze tests and classroom performance. Forty-eight students from grades two, four, and six were asked to read a passage orally, and all miscues were counted and categorized according to the descriptions of the seven comprehension measures. The students then took a cloze test on the same passage. Two of the seven measures were shown to predict cloze performance and distinguish high from low ability groups. The findings suggest that a comprehending measure that predicts comprehension and distinguishes between ability groups can be drawn from oral reading performance; however, the measures that emerged from the study did not appear strong in terms of distinguishing ability groups from one another. (FL)

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# Theoretically Derived Variants of the Comprehending Score: Relationships between Oral Reading, Cloze Performance and Classroom Reading Ability

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# Theoretically Derived Variants of the Comprehending Score: Relationships between Oral Reading, Cloze Performance and Classroom Reading Ability

## Theoretical Approach

Our present methods of assessing reading comprehension include sufficient error to support the assertion that no single measure of reading comprehension should be used to determine a youngster's academic destiny. Instead, we need a framework of comprehension indicators that can verify one another and confirm a pattern of performance. If we accept the idea that remembering is confounded with comprehension in tests made up of questions administered after reading has taken place, we have reason to explore methods of assessing comprehending during reading. We have many ways of measuring reading comprehension using post reading responses, but few ways of tapping comprehending using responses drawn from the reader during the processing of printed language. The Comprehending Score, a measure derived from oral reading responses, stands as one of the few indicators of how well a reader is comprehending while he or she is actually interacting with the author's writing.

The Comprehending Score is a theoretically derived measure of language processing that identifies those miscues, oral reading errors, that indicate that the reader is making sense of the printed language he or she is attempting to read. A miscue is an oral reading response that deviates from the expected response, an oral reading error (K. Goodman, 1969). K. Goodman

and C. Burke (1973, p. 32) define the comprehending score as the sum of "...the percent of all miscues that are fully semantically acceptable..." and "...the percent of those which are not semantically acceptable but are successfully corrected." Embedded in this definition are a number of possibilities that have yet to be empirically tested. This definition includes the "fully semantically acceptable" miscues and the miscues that are semantically unacceptable in some way that have been corrected in a totally successful way. Excluded by the definition are miscues that are semantically unacceptable in some way but are not successfully corrected. It is fair to speculate that some partially semantically unacceptable miscues that are not successfully corrected may relate to comprehension in a positive manner. Also, it is conceivable that silent corrections may relate positively to comprehension. K. Goodman and C. Burke (1973, p. 32) state, "We're aware of a silent correction phenomenon, particularly with more proficient readers who correct some miscues mentally without bothering to correct them in oral reading."

It makes sense that fully semantically acceptable miscues and successfully corrected semantically unacceptable miscues should, theoretically, relate positively to comprehension. However, the definition of the Comprehending Score suggests that any miscue that is not fully semantically acceptable is semantically unacceptable. No one can argue with the truth of this statement. Any miscue that falls short of the definition is semantically unacceptable in some way, but another viewpoint

based on a different presupposition yields a different focus. A half consumed cup of coffee may be described accurately as either half empty or half full. We can accurately describe miscues that are not fully semantically acceptable, and not fully semantically unacceptable as either partially semantically acceptable or partially semantically unacceptable. Similarly, we can accurately describe miscues that elicited a correction attempt that was not totally successful as corrected in a partially unsuccessful way or a partially successful way. Recognition of this choice in approaching the classification of miscues and the definition of the Comprehending Score represents a theoretical opening to an area of study that has heretofore remained underinvestigated. In this study, we are acting on the presupposition that any miscue that is not totally semantically unacceptable is semantically acceptable in some way or to some degree, and, therefore, it may relate positively to comprehension. A second presupposition focusses on correction behavior. Any miscue that elicits a correction attempt may relate positively to comprehension. For instance, even a totally unsuccessful correction attempt indicates that the reader senses something amiss in the original response.

Variants of the Comprehending Score can be created by including combinations of miscues that are partially semantically acceptable and partially successfully corrected. In the absence of empirical evidence describing how these miscues relate to comprehension, one can either speculate about the possibilities or undertake to study the relationships. The

present study focusses on these possibilities in an effort to determine if theoretically constructed variants of the Comprehending Score do in fact represent an area of study that warrants investigation.

This study explores relationships between post oral reading cloze test scores and seven theoretically constructed variants of the Comprehending Score. In addition, this study tests the capabilities of the seven variants of the Comprehending Score for distinguishing high, middle and low reading ability groups from one another. A post oral reading cloze test score is the percent of correct responses on a fifth word deletion cloze test administered immediately following an oral reading of the same passage by the same subject. Post oral reading cloze test scores correlate positively and significantly with reading comprehension measures (Carey, 1978). The ability groups in this study reflect the opinions of the reading teachers of the students and the assessment of the students' classroom performance by those teachers. The study probes the variants of the Comprehending Score, from two distinctly different vantage points; performance on post oral-reading cloze tests and classroom performance.

Seven variants of the Comprehending Score are created by selecting oral reading errors that exhibit varying degrees of semantic acceptability and differing types of correction behavior. A comprehending measure is sought that satisfies two requirements. First, we require that the comprehending measure exhibit concurrent validity with comprehension by correlating

significantly and positively with another indicator of comprehension, the post oral-reading cloze test. Second, we require that the comprehending measure exhibit the capability of distinguishing teacher determined reading ability groups from one another. The mission of the study is to determine if the construction of variants of the Comprehending Score warrants further study. One specific question guides the study. Which, if any of the variants of the Comprehending Score exhibits a persistent relationship to comprehension as measured by post oral-reading cloze test scores, and also exhibits the capability of distinguishing reading ability groups from one another?

## Background

Bormuth (1969) demonstrates that conventional cloze test scores correlate positively and significantly with multiple-choice tests of literal reading comprehension. A conventional cloze test is prepared by substituting a blank for every fifth word not starting with the first word of the first sentence. The subject is asked to write the word that fits best in the blank. Responses exactly corresponding to the deleted word are scored correct. Mispellings that do not represent nonsense or a word other than the deleted word are scored correct. A cloze score is the percent of total possible correct responses that are correct. Bormuth (1975) provides explicit instructions for constructing, administering, scoring, and interpreting conventional cloze tests.

A conventional cloze test is administered without prior contact of the subject with the passage. A post oral-reading cloze test is administered immediately following an oral reading of the same passage by the subject. Post oral-reading cloze test scores correlate positively and significantly with conventional cloze test scores (Page, 1975 and Ganier, 1976) and standardized test scores of reading comprehension (Carey, 1978 and 1979).

Although considerable controversy surrounds cloze test scores, particularly with respect to construct validity, cloze test scores do in fact correlate significantly and positively with other measures of reading comprehension. As such, the cloze test is a useful tool for exploratory research that depends on the characteristics of the distribution of scores. Such research represents a very different application than describing an individual's reading performance for diagnostic purposes.

The cloze procedure is surrounded by a host of valid criticisms centering on tenuous assumptions and underinvestigated alternative procedures. Alderson (1978, p. 1174) states that recent research suggests that the cloze procedure may "...prove to be merely a measure of the redundancy of the text, rather than comprehension of the content of a text and overall reading ability." Alderson (1978, p. 1173) also suggests that "...the cloze procedure only correlates with other measures of reading comprehension to the extent that they measure aspects of sentence comprehension rather than text comprehension." We

accept Alderson's criticisms of the cloze procedure as insightful and perhaps useful in establishing new directions for research on cloze.

In contrast to Alderson's criticisms of the cloze procedure, he notes historically that, "From an initial use in readability studies, it (the cloze procedure, italics mine) was soon used to measure the reading comprehension abilities of subjects, and many studies showed that cloze correlated, to varying degrees, but always positively, with respected and widely used measures of reading ability (Alderson, 1978, p. 1172)." He also indicates that, "the general conclusion from most of the cloze studies has been that cloze is a reliable and valid measure of reading comprehension (p. 1172)." Clearly, Alderson is not in total agreement with this conclusion, perhaps with good reason. However, others exhibit a different view of cloze.

Smith (1978, p. 1177) states, "The cloze procedure is typically used to determine the readability of a passage or to determine the subject's reading ability. Indeed, it has been found to be a reliable measure of both. The validity is particularly evident when placed in the context of current linguistic theory." Another reviewer, Elley (1978, p. 1175), concluded that, "Research findings on the reliability and validity of cloze procedure as an index of reading comprehension are numerous and quite impressive." Elley (1978, p. 1175) indicates that, "Concurrent validity coefficients, using multiple choice tests as criterion, cluster for the most part between .65 and .90." When both the multiple choice and cloze

tests use the same passages, Elley indicates that the coefficients exceed .80. Despite Alderson's criticisms, for the purpose of the present study, cloze remains an acceptable positive correlate of reading comprehension, a strong enough indicator to adequately answer the research questions.

Comprehending

The Comprehending Score is defined by Rousch (1976, p. 133) as, "...the number of semantically acceptable miscues and those miscues that were originally unacceptable but later corrected." Rousch's definition differs slightly from the definition provided by K. Goodman and Burke (1973, p. 32) who refer to the sum of percents, not numbers, when they state, "Comprehending is a process. It is obtained by adding to the percent of all miscues that are fully semantically acceptable, the percent of those that are not semantically acceptable but are successfully corrected." K. Goodman and C. Burke (1973) show Comprehending Scores positively and significantly correlated with retelling ratings. A retelling rating is a score derived by analyzing the way a subject retells a story on tape immediately following an oral reading of the same story. P.D. Allen and D. Watson (1976) describe procedures for analyzing a retelling. In a split plot design with third, fourth and fifth grade readers, Anania (1975) shows both conventional Comprehending Scores and those with dialect related miscues removed to be significantly and positively correlated with conventional cloze scores derived according to the method described by Bormuth (1975). Comprehending Scores are shown to correlate significantly and

positively with post oral-reading cloze test scores (Page, 1976) and with standardized test scores of reading comprehension (Carey, 1978 and 1979).

Definitions of Seven Measures

Acting on the presuppositions described in the theoretical approach described earlier, we undertake to create some testable variants of the Comprehending Score. Table 1 summarizes the definitions and the raw material from which the variants are constructed. The seven variants are labeled C1, C2, C3, C4, C5, C6, and C7 for convenience.

Comprehending measure C1 is defined as the percent of semantically totally acceptable miscues (SE1) added to the percent of successfully corrected semantically totally unacceptable miscues (SE2). This measure is conceptually related to the Comprehending Score which includes the percent of all successfully corrected miscues that are semantically unacceptable in some way and the percent of all miscues that are fully semantically acceptable. Measure C1 does not include partially semantically acceptable miscues, whether they are successfully corrected, partially corrected, or unsuccessfully corrected.

Comprehending measure C2 is defined as the sum of percents of uncorrected semantically totally acceptable miscues (SE1), successfully corrected semantically totally unacceptable miscues (SE2), and successfully corrected miscues that are semantically acceptable only with prior or following portions of the sentence (SE3). This measure, C2, adds SE3 to C1. The miscues

represented in SE3 may be thought of as partially acceptable or partially unacceptable. In adding SE3 to C1 to produce C2, focus is on the degree of acceptability of the miscues in order to determine what if any contribution is made to positiveness in a correlative relationship with a measure of comprehension.

Comprehending measure C3 is defined as the sum of percents of uncorrected semantically totally acceptable miscues (SE1), successfully corrected totally semantically unacceptable miscues (SE2), and successfully corrected semantically totally acceptable miscues (SE4). With C3, we can ask if successfully corrected semantically totally acceptable miscues (SE4) contribute positively to whatever correlative relationships is exhibited between C2 and a measure of comprehending.

Comprehending measure C4 is defined as the sum of percents of uncorrected semantically totally acceptable miscues (SE1), successfully corrected semantically totally unacceptable miscues (SE2), and the residual percentage of uncorrected semantically totally unacceptable miscues (SE5). The last component identified (SE5) is related to the concept of residual miscues defined by K. Goodman and C. Burke (1973, p. 41) as miscues per hundred words "reduced by the comprehending score" leaving the "miscues which remain unacceptable and thus might interfere with the reader getting meaning from the passage." The component SE5 is the percent of uncorrected totally semantically unacceptable miscues (SE6) subtracted from 100 percent.. Uncorrected, semantically unacceptable miscues (SE6) might be expected to

correlate negatively with a measure of comprehension. Because our search in this study is for comprehending measures that correlate positively with a comprehension measure, the inverse of the distribution represented by SE6 is our concern. By subtracting SE6 from 100, an inverse distribution is created that retains the characteristics of the SE6 distribution, but functions in a positive correlative mode in relation to comprehension.

Comprehending measure C5 is defined as the sum of percents of miscues that are totally semantically acceptable and uncorrected (SE1), totally semantically unacceptable and successfully corrected (SE2), miscues that are semantically acceptable with prior or following portions of the sentence and successfully corrected (SE3), and the residual percentage of miscues that are totally semantically unacceptable and uncorrected (SE5). Comprehending measure C5 may be expressed as SE3 added to C4. Another way to describe comprehending measure C5 is to conceive of SE5 added to C2.

Comprehending measure C6 is defined as the sum of percents of uncorrected totally semantically acceptable miscues (SE1), successfully corrected totally semantically unacceptable miscues (SE2), successfully corrected totally semantically acceptable miscues (SE4), and the residual percent of uncorrected totally semantically unacceptable miscues (SE5). Comprehending measure C7 may be expressed as C6 minus SE2, or C3 minus SE2 plus SE5.

The seven comprehending measures described above represent

combinations of ideas based on the concept of the Comprehending Score (K. Goodman and C. Burke, 1973). The variation is achieved by including miscues that exhibit differing degrees of semantic acceptability and differing modes of correction behavior in oral reading. Table 1 summarizes the definitions of of each of the seven comprehending measures.

(INSERT TABLE 1)

## Procedures

One passage of over 250 words is selected from a fifth grade basal reader with which the students in the study are not familiar. According to the Fry Readability Procedure (E. Fry, 1972) the passage is estimated to be at about the fifth grade level of readability. Two versions of the passage are prepared. One version is provided in its unmutilated form, for use in the oral reading portion of the study. A second version is prepared in cloze form b retyping and substituting a blank for every fifth word not starting with the first word.

Subjects are drawn from a single urban school in which teachers in each grade ranked students from highest to lowest in reading ability. Grade level ranked lists are divided into quarters. The two males and two females nearest each quartile are selected for the sample, generating four high, four middle, and four low ability students from each grade. This procedure yields twelve students per grade. Students are from grades two, four, and six. The sample totals forty-eight students in all.

Subjects are audio tape recorded orally reading the passage from the unmutilated version. Immediately following the oral reading, subjects are administered a post oral-reading cloze test. A preliminary cloze test experience is used to acquaint students with the cloze task.

Miscues

All miscues are counted and categorized according to the descriptions of the seven comprehending measures (C1, C2, C3, C4, C5, C6, and C7). See Table 1 for descriptions. Miscues are identified in accordance with procedures described by K. Goodman and C. Burke (1973) and P.D. Allen and D. Watson (1976).

Cloze Tests

Cloze responses that correspond exactly to the deleted word are scored correct. Cloze responses that are mispellings that can not be construed to be a word or nonsense response other than the deleted word are scored correct. Raw scores are transformed to percents (POC) of the total number of correct responses. The cloze tests used in this study are post oral-reading cloze tests (POC), cloze tests that are administered immediately following an oral reading of the same passage by the same subject. Post oral-reading cloze tests are prepared and scored in accordance with procedures described by Bormuth (1975), and administered in accordance with procedures described by Page (1975) and Carey (1978).

Analyses

Two analyses are performed. In the first analysis, zero order (r) and partial ($r_a$) correlations adjusted for grade level effects are calculated between cloze scores (POC) and the seven

comprehending measures (C1, C2, C3, C4, C5, C6, and C7). Table 2 shows the results of the first analysis. In a second approach, analyses of variances are performed identifying the differences between means of each of three ability level groups (high, middle, and low for each of the seven comprehending measures C1, C2, C3, C4, C5, C6 and C7 ). Table 3 shows the results. An a posteriori ranges test using a least significant difference is applied showing which ability groups are alike or different with respect to each of the seven comprehending measures.

Null Hypotheses

The summary null hypothesis for the first analysis states that no positive significant relationship persists between cloze scores (POC) and each of the seven comprehending measures (C1, C2, C3, C4, C5, C6, and C7). The summary null hypothesis for the second analysis states that there is no significant difference among the means per reading ability group (high, middle and low) of each of the seven comprehending measures (C1, C2, C3, C4, C5, C6, and C7).

Findings

The null hypothesis for the first analysis states that no significant positive relationship persists between comprehension as indicated by post oral-reading cloze test scores (POC) and each of seven comprehending measures (C1, C2, C3, C4, C5, C6, and C7). The null hypothesis is rejected at the $P < 0.001$ level of significance or better for each of the seven measures

according to the zero order correlations (r) shown in Table 1. The pattern differs for partial correlations adjusting for grade level ($r_a$). The null hypothesis is rejected at the $P < 0.05$ level of significance for comprehending measures (C1, C2, C3, C4, C5, and C6) according to the adjusted correlations ($r_a$). The null hypothesis is rejected at the $P < 0.01$ level of significance for comprehending measures C2, C4, and C5 according to the adjusted correlations ($r_a$). The null hypothesis is <u>not</u> rejected at the $P < 0.01$ level of significance for comprehending measures C1, C3, C6 and C7 according to the adjusted correlations ($r_a$). Table 2 shows the results.

(INSERT TABLE 2)

The null hypothesis for the second analysis states that no significant difference persists between ability group means (high, middle, and low) for each of the seven comprehending measures (C1, C2, C3, C4, C5, C6, and C7). The null hypothesis is rejected at the $P < 0.05$ level of significance for comprehending measures C1, C2, C3, C5, and C7. Comprehending measures C3, C5, and C7 exhibit nearly significant levels, while comprehending measures C1 and C2 are clearly <u>not</u> significant. Table 3 shows the results.

(INSERT TABLE 3)

The results of the a posteriori ranges tests using least

at the $P < 0.05$ level of significance. The second requirement is partially satisfied by comprehending measures C4, C5 and C7. Comprehending measures C4 and C6 satisfy the first requirement well, and the second to some degree. Comprehending measure C4 exhibits a partial correlation adjusted for grade level of $r_a = 0.34$ ($P < 0.09$) with post oral-reading cloze test scores (POC), while C6 exhibits an $r_a = 0.33$ ($P < 0.012$), slightly less than C4. Comprehending score C4 exhibits an ANOVA F ratio of 3.666 ($P < 0.034$), and C6 shows an F ratio of 3.972 ($P < 0.026$), indicating that C6 distinguishes ability groups slightly better than C4. Measure C4 distinguishes between high and low ability groups. Measure C6 distinguishes between the high ability group from the middle and low ability groups, but does not distinguish the middle group from the low ability group.

Comprehending measures C4 and C6 predict comprehension well and distinguish ability groups to some degree, however, these measures fall short of what we were seeking because they do not distinguish each ability group from the others. The characteristics of the sample design may have contributed to the fact that C4 and C6 did not fully distinguish ability groups from one another. Ability groups in this sample were selected from ranked lists by centering the low group at the lowest quartile, the middle group at the middle quartile, and the high group at the highest quartile. Quartiles fall at 25%, 50%, and 75% points on the percentile distribution. A standard deviation is about 34% from the mean and cuts the distribution at about 16% and 84%. Therefore, the low and high quartile centered groups

in this study each fall within one standard deviation from the middle group on the distribution created by the ranked lists. It is possible that a study with low and high ability groups selected from students lower and higher than one standard deviation from the mean, with the middle group remaining the same, might produce scores per ability group that are distinguishable from one another using the C4 and C6 comprehending measures.

The major thrust of this study is exploratory. The study shows that a comprehending measure that predicts comprehension and distinguishes between ability groups can be drawn from oral reading performance. The measures that emerged from this study do not appear strong in terms of distinguishing ability groups from one another. By varying the structure of the sample, the measures used in this study may prove strong enough to be practical. By varying the degrees of semantic acceptability and correction behavior, we can generate new variables that may prove to be useful in assessing the process of comprehending while reading. This study provides an initial demonstration that the technique of creating new variables based on the concept of a comprehending score is productive and warrants further study. It is a reasonable expectation that studies pursuing this line of reasoning, with this or similar methodologies, can produce comprehending measures drawn directly from oral reading that both predict comprehension and fully distinguish ability groups.

## Table 1

SUMMARY OF DEFINITIONS OF SEVEN COMPREHENSION MEASURES
(C1, C2, C3, C4, C5, C6, C7)

C1 = SE1 + SE2

C2 = SE1 + SE2 + SE3

C3 = SE1 + SE2 + SE4

C4 = SE1 + SE2 + SE5 = (100 - SE6) + SE1 + SE2

C5 = SE1 + SE2 + SE3 + SE5 = (100 - SE6) + SE1 + SE2 + SE3 = C4 + SE3

C6 = SE1 + SE2 + SE4 + SE5 = (100 - SE6) + SE1 + SE2 + SE4 = C3 + SE5

C7 = SE1 + SE4 + SE5 = (100 - SE6) + SE1 + SE4 = C6 - SE2

SE1 = Percent of uncorrected semantically totally acceptable miscues

SE2 = Percent of successfully corrected semantically totally unacceptable miscues

SE3 = Percent of successfully corrected miscues that are semantically acceptable only with prior or following portions of the sentence

SE4 = Percent of successfully corrected semantically totally acceptable miscues

SE5 = Residual percent of uncorrected semantically totally unacceptable miscues, or 100 - SE6

SE6 = Percent of uncorrected semantically totally unacceptable miscues

## Table 2

UNIVARIATE STATISTICS, ZERO ORDER CORRELATIONS (r) AND PARTIAL CORRELATIONS ADJUSTED FOR GRADE LEVEL ($r_a$) OF CLOZE SCORES (POC) WITH SEVEN MEASURES OF COMPREHENDING (C1, C2, C3, C4, C5, C6, AND C7) N = 48

| | M | S.D. | r | P< | $r_a$ | P< |
|---|---|---|---|---|---|---|
| POC | 52.1 | 24.1 | 1.00 | 0.000 | 1.00 | 0.000 |
| C1 | 26.8 | 11.9 | 0.47 | 0.001 | 0.33 | 0.012 |
| C2 | 32.5 | 12.9 | 0.54 | 0.001 | 0.38 | 0.005 |
| C3 | 31.5 | 16.3 | 0.47 | 0.001 | 0.29 | 0.023 |
| C4 | 113.6 | 19.3 | 0.54 | 0.001 | 0.34 | 0.009 |
| C5 | 119.3 | 20.3 | 0.57 | 0.001 | 0.37 | 0.005 |
| C6 | 118.5 | 22.9 | 0.54 | 0.001 | 0.33 | 0.012 |
| C7 | 114.6 | 24.2 | 0.49 | 0.001 | 0.24 | 0.054 |

## Table 3

MEANS, STANDARD DEVIATIONS, F RATIOS, AND SIGNIFICANCE LEVELS FOR SEVEN COMPREHENDING MEASURES (C1, C2, C3, C4, C5, C6, AND C7) COMPARED ACROSS THREE ABILITY LEVEL GROUPS (HIGH, MIDDLE, AND LOW) N FOR TOTAL GROUP = 48, N FOR EACH ABILITY LEVEL GROUP = 16

| | Ability Level Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | High | | Middle | | Low | | | |
| | M. | S.D. | M. | S.D. | M. | S.D. | F | P< |
| C1 | 31.1 | 10.2 | 24.7 | 11.7 | 24.5 | 13.2 | 1.607 | 0.212 |
| C2 | 35.8 | 11.4 | 31.7 | 13.1 | 30.2 | 14.2 | 0.798 | 0.456 |
| C3 | 38.8 | 15.6 | 27.3 | 13.5 | 29.0 | 18.0 | 2.484 | 0.095 |
| C4 | 122.8 | 11.4 | 112.4 | 20.4 | 105.5 | 21.3 | 3.666 | 0.034 |
| C5 | 127.5 | 13.4 | 119.4 | 21.5 | 111.1 | 22.6 | 2.822 | 0.070 |
| C6 | 130.6 | 17.2 | 115.0 | 22.3 | 110.0 | 24.6 | 3.972 | 0.026 |
| C7 | 125.4 | 19.2 | 111.6 | 25.2 | 106.9 | 25.1 | 2.702 | 0.078 |

## Table 4

A POSTERIORI RANGES TEST USING LEAST SIGNIFICANT DIFFERENCE ($P < 0.05$) TO CREATE DISTINGUISHABLE HOMOGENEOUS SUBGROUPS (I and II) WITH RESPECT TO MEANS OF ABILITY LEVEL GROUPS (HIGH, MIDDLE, AND LOW) N FOR TOTAL GROUP = 48, N FOR EACH ABILITY GROUP = 16

| | Low | Middle | High |
|---|---|---|---|
| C1 | I | I | I |
| C2 | I | I | I |
| C3 | I,II | I, | II |
| C4 | I | I,II | II |
| C5 | I | I,II | II |
| C6 | I | I | II |
| C7 | I | I,II | II |

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